(12) UK Patent Application (19) GB (11) 2 357 576 (13) A

(43) Date of A Publication 27.06.2001

(21) Application No 9930228.3

(22) Date of Filing 21.12.1999

(71) Applicant(s)
Draco Tech International Corp
(Incorporated in Taiwan)
No 2, 2nd Floor, Fu Kuei First Road, Pei-Tou, Taipei, Taiwan

(72) Inventor(s)
Chien-Chung Cheng

(74) Agent and/or Address for Service
Marks & Clerk
57-60 Lincoln's Inn Fields, LONDON, WC2A 3LS, United Kingdom

(51) INT CL[7]
A61B 5/01 // G01K 13/00

(52) UK CL (Edition S)
G1A AAMT AA1 AG15 AR6

(56) Documents Cited
WO 90/05902 A1 **US 4993424 A**

(58) Field of Search
UK CL (Edition R) **G1A AAMT**
INT CL[7] **A61B 5/01 , G01K 13/00**
ONLINE: WPI EPODOC PAJ

(54) Abstract Title
An ear temperature measuring device

(57) The device consists of a housing (3) and a detection assembly, which includes a hollow cone shaped detection head (4) fixed to one side of the housing, and an infrared sensor (5) mounted in the detection head having its detection surface (51) almost flush with a front opening of the detection head. A heat conducting material (6) is applied over a contact area between the sensor and the detection head so that heat is conducted from the sensor to the head to be radiated therefrom. When the detection head is placed in the ear, the infrared sensor close to the front opening of the detection head directly detects infrared radiated from the external auditory canal and the eardrum, its accuracy ensured as there is no obstacle between the sensor and the eardrum and the distance between them is reduced.

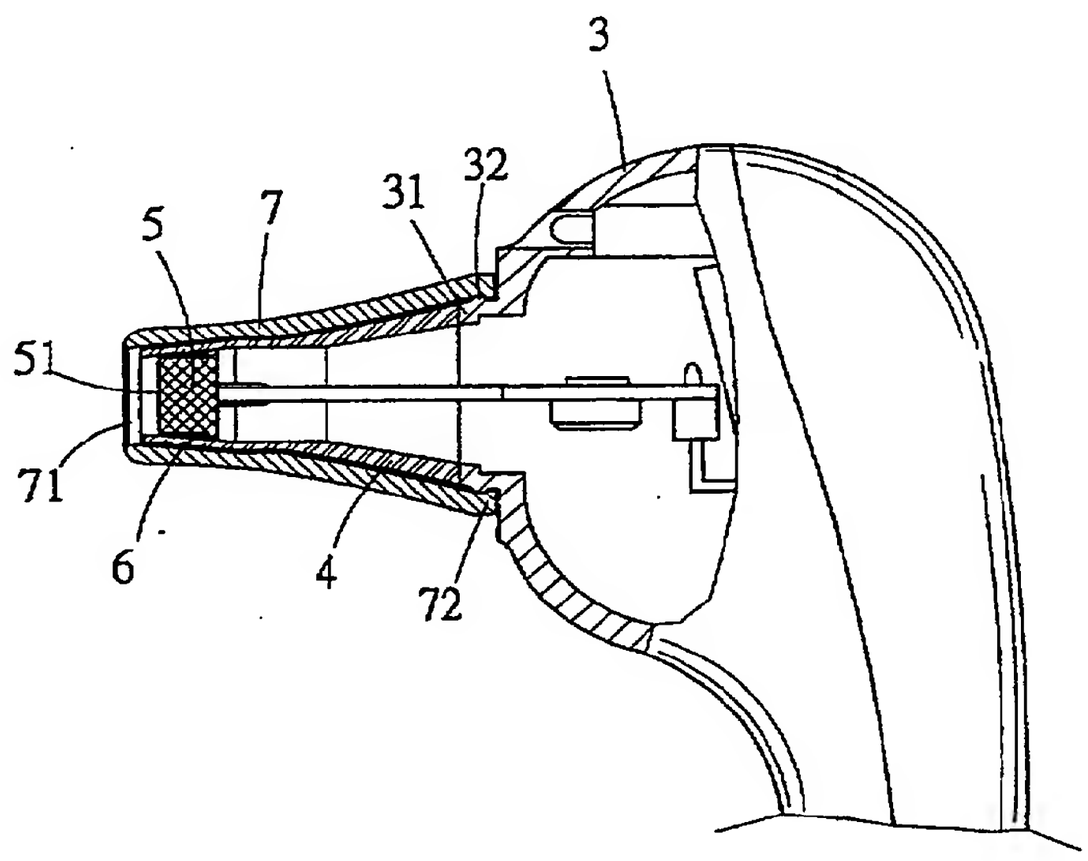


Fig.3

GB 2 357 576 A

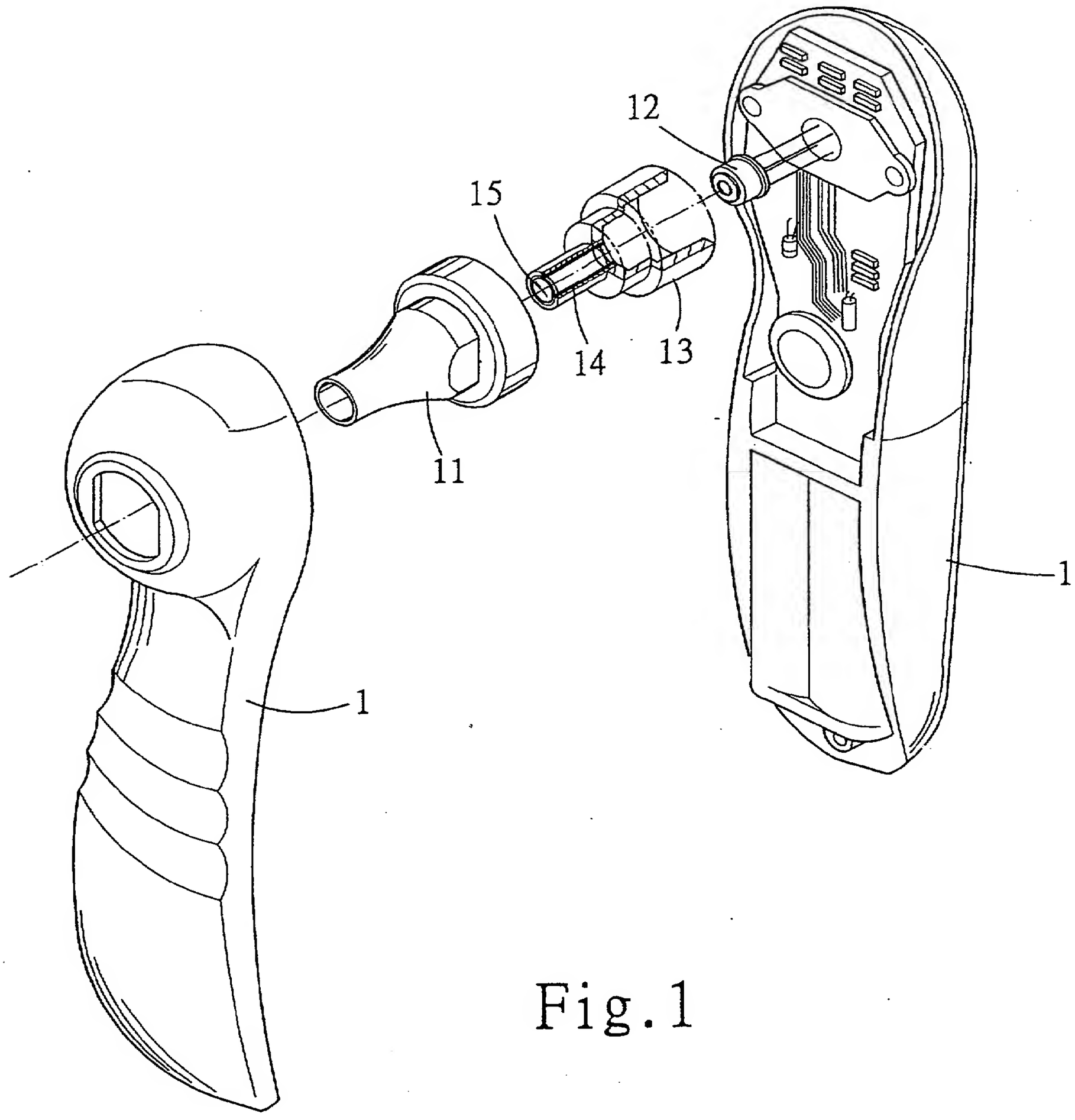


Fig.1

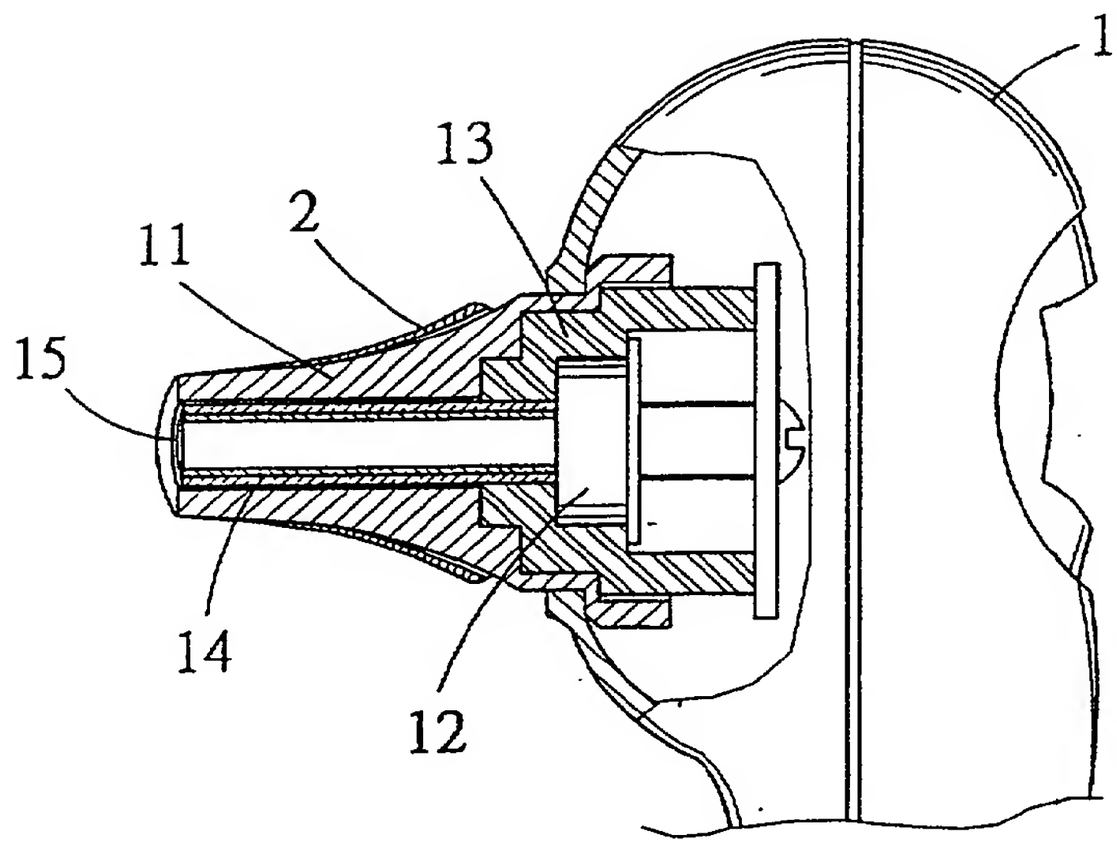


Fig.2

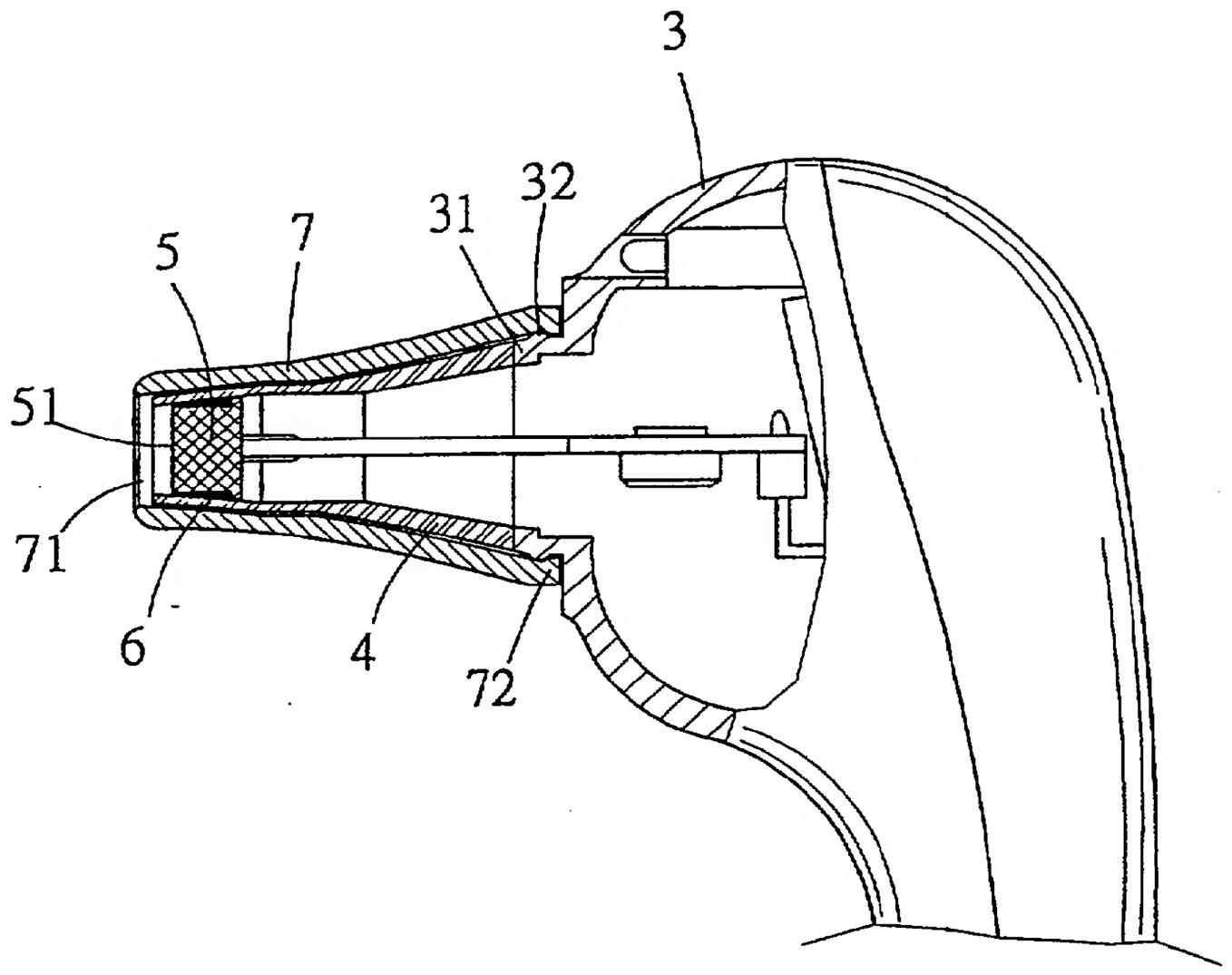
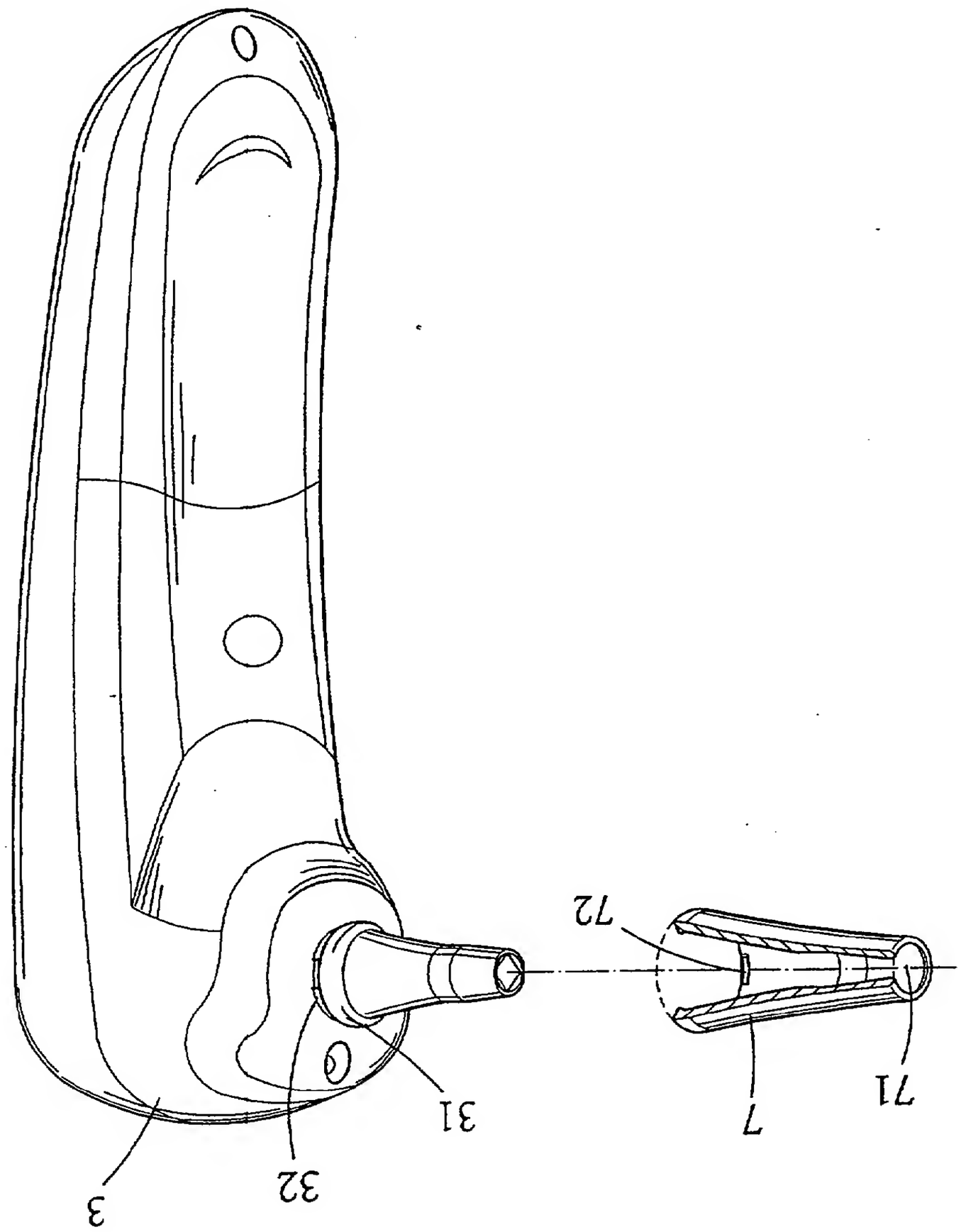


Fig.3

Fig.4



4/4

A THERMOSCAN WITH SIMPLIFIED DETECTION ASSEMBLY

The present invention relates to a thermoscan for taking temperature at ear, and more particularly to a thermoscan having a structurally simplified detection assembly to reduce production cost and enable even more accurate temperature taking.

There are different areas on a body, such as oral cavity, eardrum, rectum and armpit, at where a body temperature is usually taken. However, it is also known the temperature taken at eardrum is far more accurate than that taken at other areas in terms of reflecting a real body temperature. For this reason, a thermoscan for scanning an infrared radiation temperature at eardrum is developed. Since such thermoscan enables a user to take body temperature quickly, conveniently and accurately, it is widely adopted in professional and domestic health care. A problem with the conventional thermoscan is it has a structurally complicated detection assembly and therefore could not be easily manufactured at low cost.

Please refer to Figs. 1 and 2 that are exploded perspective

and assembled sectional views, respectively, of a conventional thermoscan for taking temperature at ear. As shown, the conventional thermoscan includes a housing 1 and a detection assembly fixed to one side of the housing 1 near a top thereof. The detection assembly includes a hollow truncated cone-shaped detection head 11 having a rear end connected to the housing 1 and a front end providing a front opening, a multi-step and hollow basic tube 13 fitly mounted in a rear portion of the detection head 11, an infrared sensor 12 disposed in the basic tube 13, and a waveguide 14 fixedly connected to a detection front surface of the infrared sensor 12. As can be clearly seen from Figs. 2, the waveguide 14 is located in a most front part of the basic tube 13. A membrane film 15 covers a front opening of the basic tube 13 to prevent dust from entering into the basic tube 13. Wherein, the basic tube 13 is generally made of a nickel-plated copper tube and the waveguide 14 is generally made of an internally and externally mirror-finished and gold-plated copper tube to enable increased infrared reflectivity thereof.

When taking a patient's eardrum temperature with the above-described thermoscan, the detection head 11 is extended into the patient's external auditory canal, allowing infrared ray radiated from the external auditory

canal and the eardrum to reach the infrared sensor 12 via the waveguide 14. An internal operating unit in the thermoscan conducts operation and outputs a corresponding body temperature value via an output means. In the course of taking the ear temperature, it is inevitably the detection head 11 would contact with the patient's external auditory canal and be contaminated. To prevent possible infection caused by the contaminated detection head 11, a cap 2 is generally provided to cover the detection head 11 as sanitary and protective measures. This is particularly necessary in medical organizations. To ensure absolute sanitation and safety in use, the cap 2 is preferably a disposable cap for use only once before it is discarded.

The following are disadvantages found in the use of the above conventional thermoscan and the cap 2:

1. The manufacture of the basic tube 13 and the waveguide 14 causes extra cost to the thermoscan, particularly the waveguide 14 that is mirror-finished and gold-plated on both inner and outer surfaces thereof to increase difficulties and unnecessary waste in the production of the thermoscan. Therefore, the conventional thermoscan is always sold at very high price.

2. The infrared sensor 12 is located at an inner end of the waveguide 14 and therefore an overly long distance exists between the detection front surface of the sensor 12 and the front opening of the detection head 11. In the event the waveguide 14 is not evenly gold-plated on its surfaces to adversely decrease its infrared reflectivity, this long distance would worsen the decreased infrared reflectivity of the waveguide 14. Moreover, both the membrane film 15 and the cap 2 would form barriers that adversely affect the accuracy of infrared temperature taken with the conventional thermoscan.

3. In the event controls over materials and techniques for manufacturing the membrane film 15 and the cap 2 are poor, the membrane film 15 and the cap 2 would have largely reduced infrared permeability and cause errors in detecting infrared rays.

4. The membrane film 15 in front of the basic tube 13 tends to break due to improper touch of it. It is very possible for dust to easily enter the waveguide 14 and even arrive the detection front surface of the infrared sensor 12 via a broken or damaged membrane film 15 to adversely affect the accuracy of detected temperature. Moreover,

the waveguide 14 has very small internal diameter and is therefore not easily wiped or cleaned to remove dust in it. That is, it is uneasy to clean and/or maintain the conventional thermoscan.

It is therefore tried by the inventor to develop an improved thermoscan having simplified detection assembly to enable easy manufacture and reduced cost of the thermoscan as well as to effectively increase the accuracy of the ear temperature scanned with the improved thermoscan.

A primary object of the present invention is to provide a thermoscan that includes a simplified detection assembly to largely reduce the manufacturing cost of the thermoscan and effectively increase the accuracy of temperature scanned.

To achieve the above and other objects, the thermoscan of the present invention mainly includes a housing and a detection assembly fixedly connected to one side of the housing. The detection assembly includes a hollow and truncated cone-shaped detection head and an infrared sensor mounted in the detection head. The detection assembly of

the present invention is characterized in that the infrared sensor is located close to a front end of the detection head with a detection front surface of the sensor being almost flush with a front opening of the detection head, that a type of heat-radiation promoting material is applied over a contact area between an outer peripheral surface of the infrared sensor and an inner wall surface of the detection head, and that a disposable cap made of a material less hard than the housing and having a front opening is selectively covered on the detection head for sanitation purpose.

The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, given by way of example, wherein

Fig. 1 is an exploded perspective of a conventional thermoscan;

Fig. 2 is a fragmentary sectional view of the thermoscan of Fig. 1 in an assembled state;

Fig. 3 is a fragmentary sectional view of a thermoscan according to an embodiment of the present invention; and

Fig. 4 is a perspective showing the use of the thermoscan of the present invention, wherein a part of the cap thereof is cut away to show an internal structure thereof.

Please refer to Fig. 3 that is a fragmentary sectional view of a thermoscan according to an embodiment of the present invention and Fig. 4 that is a perspective of the thermoscan of Fig. 3 with a cap thereof partially cut away to show retaining means provided thereat. As shown, the thermoscan mainly includes a housing 3 having a connection portion 31 that forward projects from an upper front of the housing 3 and has an annular rib 32 formed around an outer periphery of a free end of the connection portion 31, and a detection assembly connected to the housing 3 at the connection portion 31. The detection assembly further includes a detection head 4 in the form of a hollow cone fixedly connected to the connection portion 31 from an outer side thereof, an infrared sensor 5 directly mounted in the detection head 4 close to a front opening of the detection head 4 so that a detection front surface 51 of the infrared

sensor 5 is almost flush with the front opening of the detection head 4, silicone compound 6 applied between an outer peripheral surface of the infrared sensor 5 and an inner wall surface of the detection head 4, and a disposable cap 7 that has a front opening 71 and retaining means 72 provided along a rear inner periphery of the cap 7 for engaging with the annular rib 32 around the connection portion 31 on the housing 3 and thereby attaching the cap 7 to the connection portion 31.

The housing 3 is preferably made of a polymerized resin having high hardness, such as ABS. And the cap 7 is preferably made of a polymerized resin having low hardness, such as PP. That is, the cap 7 is of a soft structure compared to the housing 3. This arrangement allows the cap 7 to be connected to or removed from the connection portion 31 without causing damage to or breaking rib 32. The detection head 4 is preferably made of a nickel-plated copper tube. The silicone compound 6 is applied to provide the metal detection head 4 with better thermal conductivity and accordingly enhanced heat radiation effect.

With the above-mentioned simplified structure of the detection assembly of the present invention, the multi-step basic tube 13 and the waveguide 14 in the conventional

thermoscan are omitted to largely reduce technique and cost required in the production of a thermoscan. In actual application of the thermoscan, the use of cap 7 may be optionally decided depending on actual needs. For example, a medical organization would generally have to purchase a large quantity of caps 7 to avoid repeated use of the same one cap 7. Since the detection front surface 51 of the infrared sensor 5 is located very close to the front opening of the detection head 4, infrared ray radiated by the external auditory canal and the eardrum could very easily arrive the detection front surface 51 of the infrared sensor 5 when the thermoscan is used to take the temperature in the ear, no matter whether there is a cap 7 attached to the detection head 4 or not. And since there is not any barrier, that is, the membrane film 15, in the course of heat transfer to the infrared sensor 5, ear temperature can be more effectively and accurately detected. In the event of a dust-contained detection front surface 51, the infrared sensor 5 could be easily and conveniently accessed and cleaned or maintained via the front opening of the detection head 4. Moreover, the location of the detection front surface 51 that is almost flush with the front opening of the detection head 4 and the application of silicone compound 6 between the infrared sensor 5 and the detection head 4 together largely reduce heat that might exist on the

detection front surface 51 after the ear temperature has been taken. Any remained heat on the detection front surface 51 could be transferred to outer surface of the detection head 4 and quickly dissipated. This further inhibits heat from transferring to the infrared sensor 5 and therefore ensures stable and highly accurate temperature scanning next time.

The following are some of the advantages provided by the specially structured thermoscan of the present invention:

1. The sufficient thermal conductivity of the thermoscan enables the infrared sensor 5 to take accurate temperature.

2. The simplified structure of the detection assembly of thermoscan enables easy manufacture and largely reduced production cost of the thermoscan.

3. The detection front surface 51 of the infrared sensor 5 may be easily accessed and cleaned to avoid adverse influence on taking an accurate temperature.

4. The silicone compound applied on the contact area between the outer peripheral surface of the infrared

sensor 5 and the inner wall of the detection head 4 enables enhanced thermal conductivity of the detection assembly and therefore quick heat radiation therefrom.

5. The distance between the detection front surface 51 and the eardrum is largely reduced to enable more accurate temperature scanning.

The present invention has been described in an illustrative manner, and it is to be understood that the terminology used is intended to be in the nature of description rather than of limitation. Many modifications and variations of the present invention are possible in light of the above teachings. Therefore, it is to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

CLAIMS:

1. A thermoscan for taking ear temperature, comprising a housing and a detection assembly provided on said housing;

said housing being provided at an upper front with a connection portion; and

said detection assembly being fixedly attached to said connection portion of said housing to forward project therefrom, said detection assembly further comprising a detection head and an infrared sensor;

said detection head being substantially in the form of a hollow truncated cone with a front opening; and

said infrared sensor being directly mounted in said hollow detection head close to said front opening, such that a detection front surface of said infrared sensor is almost flush with said front opening of said detection head, and an outer peripheral surface of said infrared sensor that contacts with an inner wall surface of said detection head being applied with a material that promotes heat radiation from said detection assembly.

2. A thermoscan as claimed in claim 1, wherein said material promoting heat radiation is a silicone compound.

3. A thermoscan as claimed in claim 1, wherein said detection head is optionally covered with a disposable cap, said cap being made of a material having a hardness lower than that of a material used to produce said housing, said cap having a front opening corresponding to said front opening of said detection head and a rear end having retaining means provided along an inner peripheral of said rear end to removably engage with an annual rib provided along an outer periphery of said connection portion of said housing.

4. A thermoscan substantially as herein described with reference to Figures 3 and 4 of the accompanying drawings.

Amendments to the claims have been filed as follows

CLAIMS:

1. An ear thermometer for taking ear temperature, comprising a housing and a detection assembly provided on said housing;

said housing being provided at an upper front with a connection portion; and

said detection assembly being fixedly attached to said connection portion of said housing to forward project therefrom, said detection assembly further comprising a detection head and an infrared sensor;

said detection head being substantially in the form of a hollow truncated cone with a front opening; and

said infrared sensor being directly mounted in said hollow detection head close to said front opening, such that a detection front surface of said infrared sensor is almost flush with said front opening of said detection head, and an outer peripheral surface of said infrared sensor that contacts with an inner wall surface of said

detection head, and a material being provided in an area between an outer peripheral surface of said infrared sensor and an inner wall surface of said detection head to enhance thermal conductivity from said infrared sensor to said detection head, so that conducted heat is then radiated from said detection head.

2. An ear thermometer as claimed in claim 1, wherein said material promoting heat radiation is a silicone compound.

3. An ear thermometer as claimed in claim 1, wherein said detection head is optionally covered with a disposable cap, said cap being made of a material having a hardness lower than that of a material used to produce said housing, said cap having a front opening corresponding to said front opening of said detection head and a rear end having retaining means provided along an inner peripheral of said rear end to removably engage with an annual rib provided along an outer periphery of said connection portion of said housing.

4. An ear thermometer substantially as herein described with reference to Figures 3 and 4 of the accompanying drawings.

The Patent Office

INVESTOR IN PEOPLE

16

Application No: GB 9930228.3 **Examiner:** Iwan Thomas
Claims searched: 1-4 **Date of search:** 13 March 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): G1A AAMT

Int Cl (Ed.7): A61B 5/01, G01K 13/00

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	WO 90/05902A1	(DIATEK) See abstract, page 3 lines 23-33 and page 5 line 23 - page 7 line 13	1&2
A	US 4993424A	(AYTON et al.) See abstract, all figs., col. 1 line 61- col. 2 line 68	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.